CLAIMS

1. A radio communication apparatus used in a plurality of communication systems each using a different frequency, comprising:

quadrature modulating means for quadrature modulating a transmission signal for one of two mobile communication systems selected from among said plurality of mobile communication systems using a first transmission intermediate frequency obtained from a difference between a transmission local frequency shared between said selected two mobile communication systems and a first transmission frequency used in one of said selected two mobile communication systems, and for quadrature modulating a transmission signal for the other mobile communication system using a second transmission intermediate frequency obtained from a difference between said transmission local frequency and a second transmission frequency used in said other mobile communication system;

first frequency converting means for frequency converting said quadrature modulated transmission signal for said one system to said first transmission frequency using said transmission local frequency and for frequency converting said quadrature modulated transmission signal for said other system to said second transmission frequency using said

transmission local frequency;

second frequency converting means for frequency converting a received signal for said one system from a first reception frequency used in said one system to a reception local frequency shared between said selected two mobile communication systems, and for frequency converting a received signal for said other system from a second reception frequency used in said other system to said reception local frequency; and

quadrature detecting means for quadrature detecting said received signal for said one system subjected to frequency conversion by said second frequency converting means using a first reception intermediate frequency obtained from a difference between said reception local frequency and said first reception frequency, and for quadrature detecting said received signal for said other system subjected to frequency conversion by said second frequency converting means using a second reception intermediate frequency obtained from a difference between said reception local frequency and said second reception frequency.

2. A radio communication apparatus used in a plurality of mobile communication systems each using a different frequency, comprising:

quadrature modulating means for quadrature modulating a transmission signal for one of two

mobile communication systems selected from among said plurality of mobile communication systems using a first transmission intermediate frequency obtained from a difference between a transmission local frequency shared between said selected two mobile communication systems and a first transmission frequency used in one of said selected two mobile communication systems, and for quadrature modulating a transmission signal for the other mobile communication system using a second transmission intermediate frequency obtained from a difference between said transmission local frequency and a second transmission frequency used in said other mobile communication system; and

first frequency converting means for frequency converting said quadrature modulated transmission signal for said one system to said first transmission frequency using said transmission local frequency, and for frequency converting said quadrature modulated transmission signal for said other system to said second transmission frequency using said transmission local frequency.

3. A radio communication apparatus used in a plurality of mobile communication systems each using a different frequency, comprising:

second frequency converting means for frequency converting a received signal for one of said two

mobile communication system selected from among said plurality of mobile communication systems from a first reception frequency used in said one system to a reception local frequency shared between said selected two mobile communication systems, and for frequency converting a received signal for said other system from a second reception frequency used in said other system to said reception local frequency; and

quadrature detecting means for quadrature detecting said received signal for one system subjected to frequency conversion by said second frequency converting means using a first reception intermediate frequency obtained from a difference between said reception local frequency and said first reception frequency, and for quadrature detecting said received signal for said other system subjected to frequency conversion by said second frequency converting means using a second reception intermediate frequency obtained from a difference between said reception local frequency and said second reception frequency.

4. The radio communication apparatus according to claim 1, further comprising:

a plurality of receiving means for receiving signals radio transmitted;

said second frequency converting means whose quantity is the same as that of said plurality of

receiving means; and

said quadrature detecting means whose quantity is the same as that of said plurality of receiving means,

wherein said plurality of receiving means performs diversity reception.

5. The radio communication apparatus according to claim 1, further comprising:

first frequency generating means for generating said transmission local frequency;

second frequency generating means for generating said reception local frequency; and

connection selecting means for selectively connecting said first frequency converting means to said first frequency generating means or said second frequency generating means,

wherein said connection selecting means connects said first frequency converting means to said second frequency generating means at a transmitting time in said one system, and connects said first frequency converting means to said first frequency generating means at a transmitting time in said other system.

6. The radio communication apparatus according to claim 1, further comprising:

first frequency generating means for generating said transmission local frequency;

second frequency generating means for generating said reception local frequency; and

connection selecting means for selectively connecting said first frequency converting means to said first frequency generating means or said second frequency generating means,

wherein said connection selecting means connects said second frequency converting means to said first frequency generating means at a receiving time in said one system, and connects said second frequency converting means to said second frequency generating means at a receiving time in said other system.

7. A mobile station apparatus having the radio communication apparatus described in claim 1.

8. A base station apparatus having the radio communication apparatus described in claim 1.

9. A radio communication method used in a plurality of mobile communication systems each having a different frequency, comprising the steps of:

quadrature modulating a transmission signal for one of two mobile communication systems selected from among said plurality of mobile communication systems using a first transmission intermediate frequency obtained from a difference between a transmission local frequency shared between said selected two

mobile communication systems and a first transmission frequency used in one of said selected two mobile communication systems;

quadrature modulating a transmission signal for the other mobile communication system using a second transmission intermediate frequency obtained from a difference between said transmission local frequency and a second transmission frequency used in said other mobile communication system;

frequency converting said quadrature modulated transmission signal for said one system to said first transmission frequency using said transmission local frequency; and

frequency converting said quadrature modulated transmission signal for said other system to said second transmission frequency using said transmission local frequency.

10. A radio communication method used in a plurality of mobile communication systems each having a different frequency, comprising the steps of:

frequency converting a received signal for one of two mobile communication systems selected from among said plurality of mobile communication systems to a ~~reception local~~ intermediate frequency shared between said selected two mobile communication systems;

frequency converting a second reception

frequency used in said other system to said reception local frequency;

quadrature detecting said received signal for said one system subjected to frequency conversion by said frequency converting step using a first reception intermediate frequency obtained from a difference between said reception local frequency and said first reception frequency; and

quadrature detecting said received signal for said other system subjected to frequency conversion by said frequency converting step using a second reception intermediate frequency obtained from a difference between said reception local frequency and said second reception frequency.